Name: _____

Problem Set #6

PART A: NO CALCULATOR

1. Which of the following statements about the function given by $f(x) = x^4 - 2x^3$ is true?

   (A) The function has no relative extremum.
   (B) The graph of the function has one point of inflection and the function has two relative extrema.
   (C) The graph of the function has two points of inflection and the function has one relative extremum.
   (D) The graph of the function has two points of inflection and the function has two relative extrema.
   (E) The graph of the function has two points of inflection and the function has three relative extrema.

2. What is the x-coordinate of the point of inflection on the graph of $y = \frac{1}{10}x^5 + \frac{1}{2}x^4 - \frac{3}{10}$?

   (A) -4 (B) -3 (C) -1 (D) $-\frac{3}{10}$ (E) 0

3. Suppose $f(x) = x^4 - ax^2$. What is the value of a if f has a local minimum at $x = 2$?

   (A) -24 (B) 8 (C) -4 (D) $-\frac{1}{2}$ (E) $-\frac{1}{6}$

4. What are the x-coordinates of the points of inflection on the graph of the function $f(x) = 3x^4 - 4x^3 + 6$

   (A) 0 only (B) $\frac{2}{3}$ only (C) 1 only
   (D) 0 and $\frac{2}{3}$ (E) 0 and 1

5. The function $f(x) = e^{x\sqrt{3}}(\cos x)$ is defined on $0 \le x \le 2\pi$. On what interval(s) is $f(x)$ decreasing?

   (A) $\frac{\pi}{4} < x < \frac{5\pi}{4}$ (B) $\frac{\pi}{3} < x < \frac{4\pi}{3}$ (C) $\frac{2\pi}{3} < x < \frac{5\pi}{3}$
   (D) $0 < x < \frac{\pi}{4}$ and $\frac{5\pi}{4} < x < 2\pi$ (E) $0 < x < \frac{\pi}{3}$ and $\frac{4\pi}{3} < x < 2\pi$

6. The graph of y = $f'(x)$ is given above. The function $f(x)$ has a local minimum nearest which value of x?

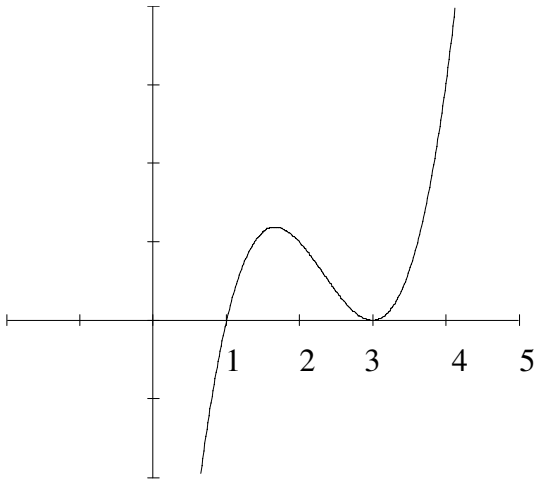
(A) 0

(B) 1

(C) 2

(D) 3

(E) 5



Part B: Graphing Calculator Allowed

7. The first derivative of the function f is given by $f'(x) = x - 4e^{-\sin(2x)}$. How many points of inflection does the graph of f have on the interval $0 < x < 2\pi$?

(A) Three (B) Four (C) Five (D) Six (E) Seven

8. The first derivative of a function, *f*, is given by $f'(x) = \frac{e^{-x}}{x^2} - \sin x$. How many critical values does *f* have on the open interval (0, 10)?

(A) One (B) Two (C) Three (D) Four (E) Five

9. If $f'(x) = x\sin x - \cos x$ for 0 < x < 4, then f has a local maximum when x is approximately

(A) 0.9 (B) 1.2 (C) 2.3 (D) 3.4 (E) 3.7

10. The graph of the function $y = \frac{1}{3}x^3 - x^2 - 5x + 3\sin x$ changes concavity at $x =$

(A) 3.29 (B) 2.21 (C) 1.34 (D) 0.41 (E) -0.39

11. The first derivative of the function f is given by $f'(x) = \frac{8\cos x}{x^2} - \frac{1}{8}$. On the open interval (1, 10) the graph of f has

(A) one relative maximum and no relative minima
(B) one relative minimum and no relative maxima
(C) two relative maxima and one relative minimum
(D) two relative minima and one relative maximum
(E) no relative extrema